

(21) Application No 9309042.1

(22) Date of filing 30.04.1993

(30) Priority data
 (31) 92UDA0081 (32) 30.04.1992 (33) IT

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(51) INT CL⁵
 A21C 11/10

(52) UK CL (Edition L)
 B5A AT20P A1G10 A1R106E A2B2 A2D2 A2E3
 A2U1B1BX A2U1B2

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(58) Field of search
 UK CL (Edition L) A2B BMB3 BMB39 BMB9 BMS1
 BMS5, B5A AT20P AT25P
 INT CL⁵ A21C
 Online databases: WPI

(54) Retaining dough products on a cutter by negative pressure

(57) Perforated and/or punched cut snacks (115), which start with the extruding and successive rolling of a layer of dough of cereals or other flour substances, the layer of dough being fed continuously, are obtained by cutting their outer profile with a plurality of hollow outlining punches (125) arranged peripherally in an organized manner on a cutter roll (29) cooperating with opposing means (27), the snacks (115) being retained momentarily within the respective hollow outlining punches (125) and then being discharged in a desired position from the specific hollow outlining punches (125). The retaining action is determined by a stationary aspiration sector (29a) included within the cutter roll (29). In the preferred embodiment a negative pressure is applied to the zone 29a and thus the hollow outlining punches (125) adjacent the zone 29a to provide the retaining action.

The snacks may be discharged from the punches by the action of a positive pressure applied to the discharge zone 29b of the cutter roll.

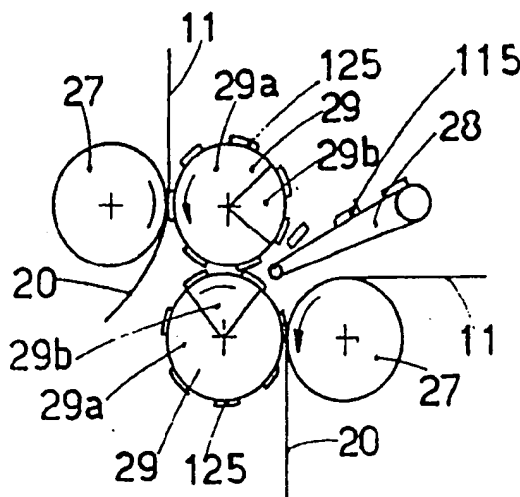


fig. 5b

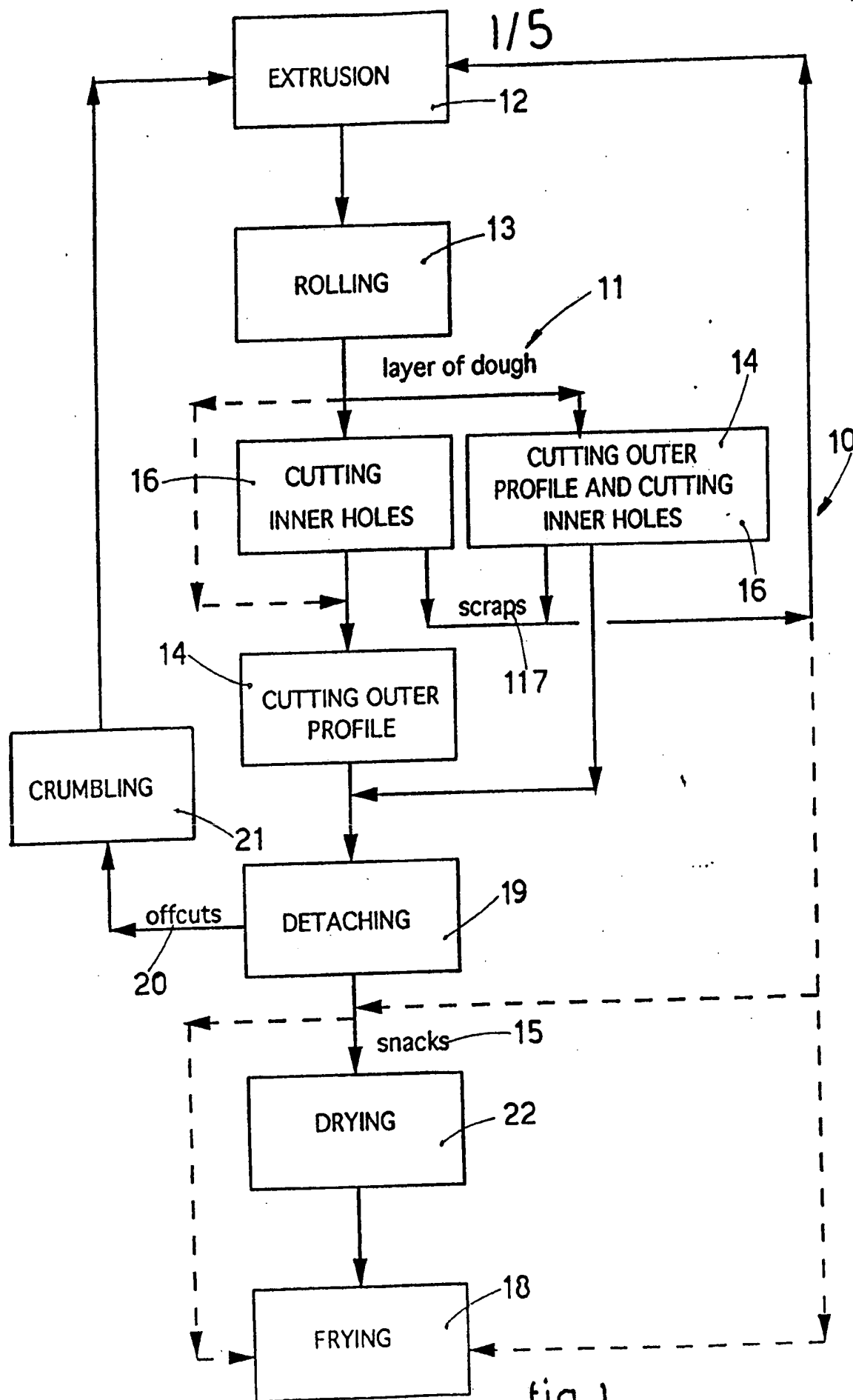
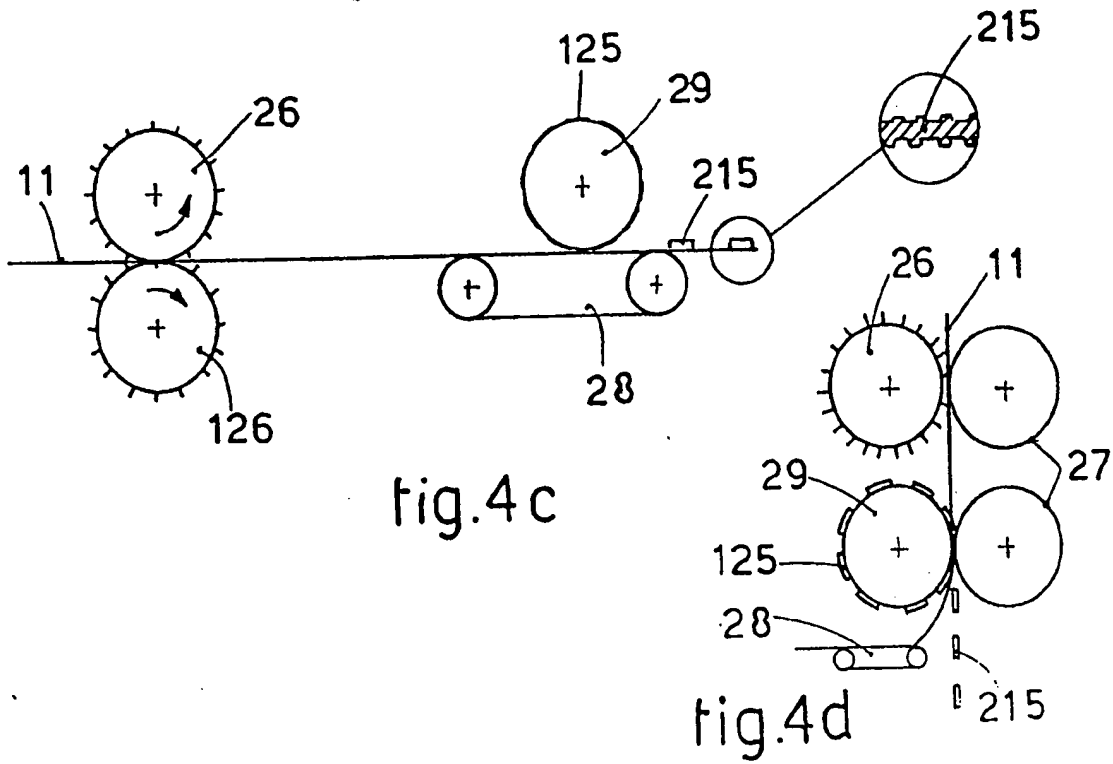
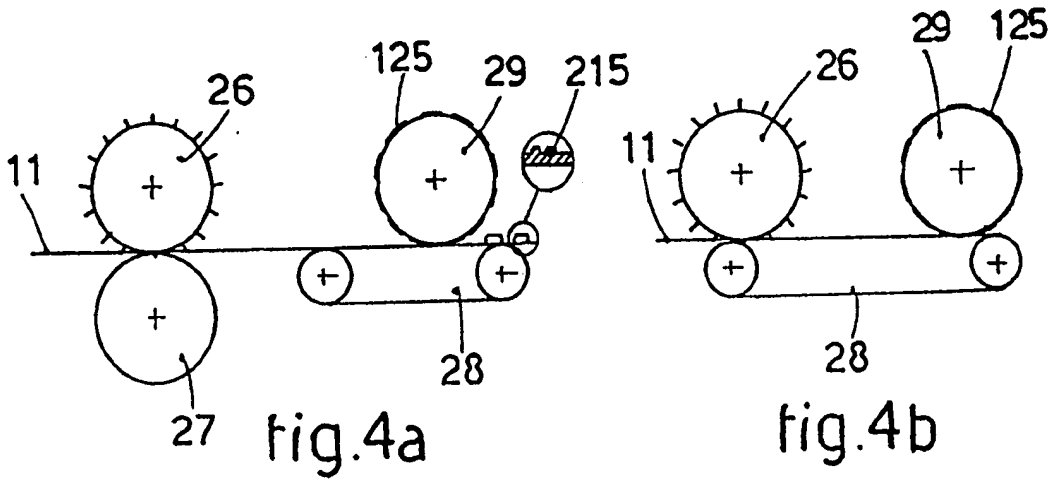
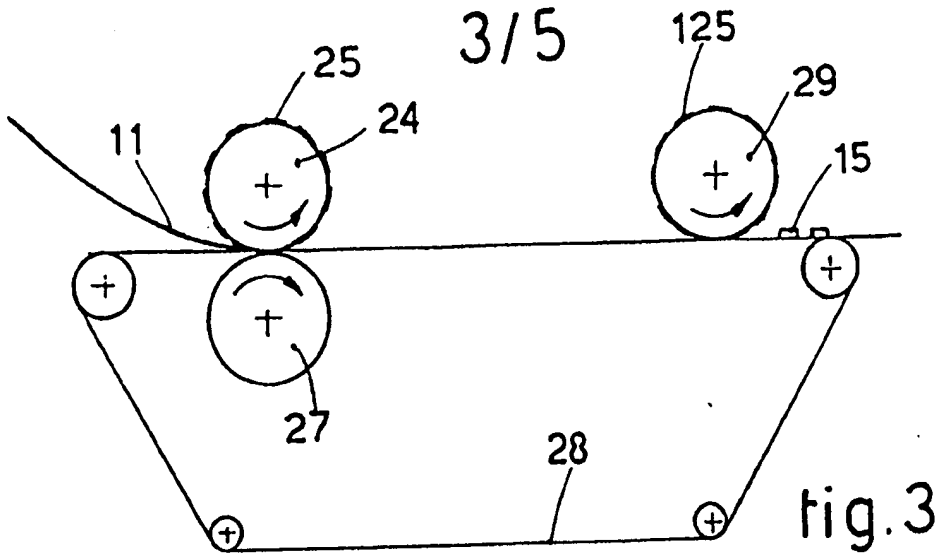
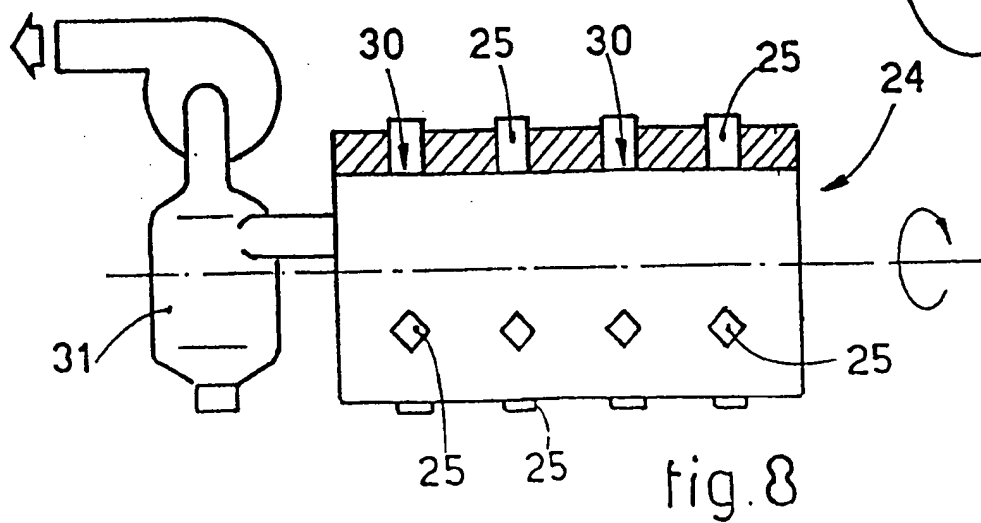
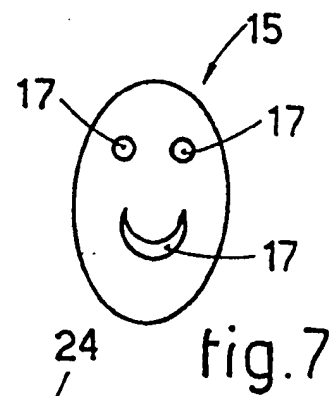
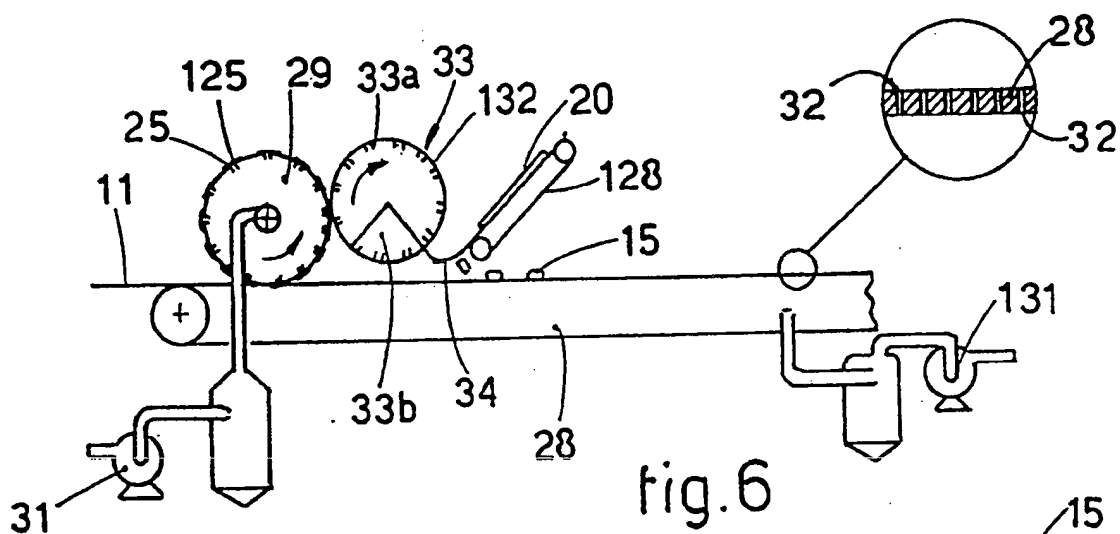
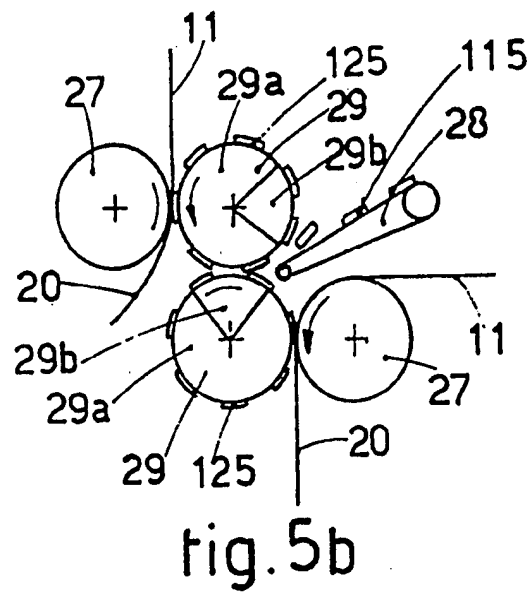
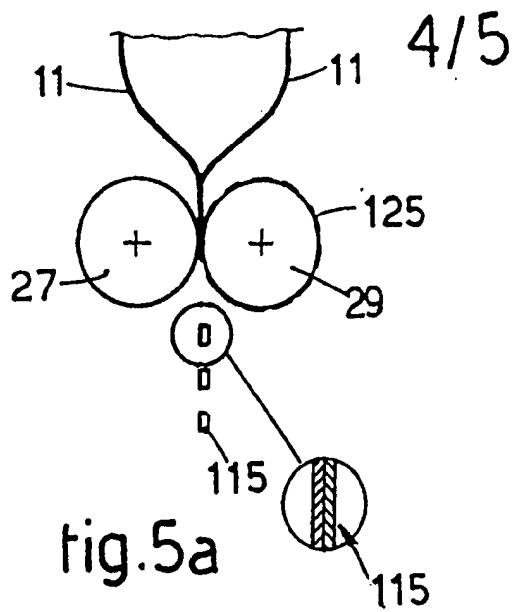


fig. 1





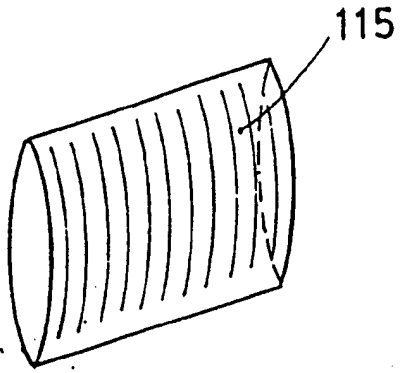


fig.9

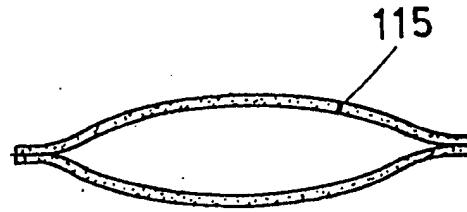


fig.10b



fig.10a

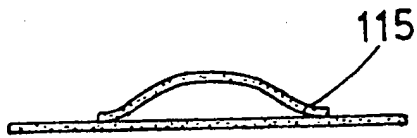


fig.11b

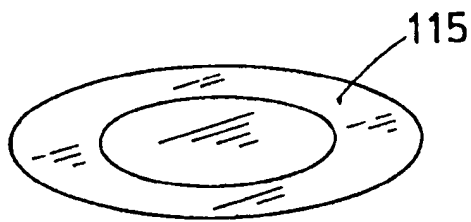


fig.11a

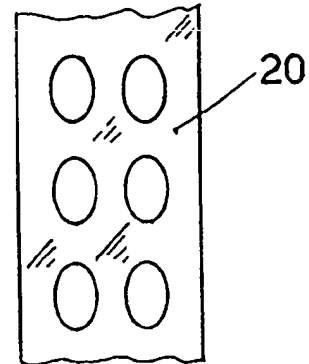


fig.12

**METHOD AND APPARATUS FOR PRODUCING PERFORATED AND/OR
PUNCHED CUT SNACKS**

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This invention relates to a method and apparatus for producing perforated and/or punched cut snacks. In particular, it relates to method and apparatus for producing two-dimensional or three-dimensional pieces of a desired shape and design from one or more layers of a dough of cereals or other flour substances, whether pre-cooked or not.

10 Perforated and/or punched cut snacks are known which consist of pre-cooked or not pre-cooked cereals or other flour substances and are moulded in a great variety of
15 shapes with or without internal holes. These products are made, for instance, of rolled or extruded layers of dough.

These layers are cut after a possible drying step.

The making of figures including holes within the outer perimeter entails two cutting actions, the first to make the internal holes and the second to cut the outer profile.

20 The result of this is the necessity to employ very large and heavy moulds having two rows of punches.

The great mass of the moulds and of the other movable parts connected to the moulds hinders the alternating movement at the high speeds required for the necessary output.

Moreover, this method makes it necessary that the sheet of dough should be halted at the time of the cutting.

30 This method therefore requires an alternating movement which forms another limit in reaching high speeds.

Moreover, this method does not overcome the problems arising from the tackiness of the material, which tends to stick to the moulds and counter moulds, and therefore the

method can only be applied to materials which have been at least partly dried and have a good mechanical consistency.

The difficulty linked to this known method of obtaining a strictly constant movement of the layer of dough entails a certain inaccuracy in the positioning of the internal holes
5 in relation to the outer perimeter of the snack and therefore an inability of achieving very good shapes.

Next, for the same reasons, it is necessary to leave a given distance between one figure and the next figure so as
10 to prevent the irregularity of the feed superimposing one figure on another.

This leads to a great increase in the offcuts and in the problems relating to the handling of the offcuts.

Systems are also known which are based on the employment
15 of rolls, but these systems use the rolls to form the layers of dough and the rolls are fed directly with the dough, thus restricting the application of the systems to products which can be made with this method.

US-A-4,348,166 refers to a system for forming layers of
20 dough which overcomes the adhesion of the sheet to the outer periphery of the forming rolls; in this case air under pressure within the counter-roll is applied since the tacky sheet tends to be retained on that counter-roll and possesses no tendency to be retained on the cutting roll.

25 In other cases rolls have been employed to mould layers of dough which are not tacky, and therefore have not overcome the problem of controlling the adhesion and removing the offcuts and the products themselves.

EP-A-0256301 characterizes the moulding but not the
30 cutting of a layer of dough and therefore does not carry out the cutting of the moulded shapes, for such moulding takes place through the effects of pressure and temperature.

EP-A-0294125 concerns the suitable and regular arrangement

of baked products (biscuits or crackers) for the purpose of making uniform their cooking in an oven; the nature of the cutter device is irrelevant, but the inclusion of a conveyor belt required to convey these products into the oven in a required manner is fundamental. This document gives no indication as to how the internal holes are made in the snacks nor does it explain how the offcuts are separated from the snacks nor how the offcuts are removed from the conveyor belt.

10 US-A-3,171,315 concerns the making of signs, designs or other items on the surface of pies already arranged at pre-set regular intervals on a feeder conveyor.

The known methods have not overcome the problem of engaging and delivering the snacks and/or offcuts advantageously to pre-set different points so as to enable them to be removed in different directions.

15 The present applicants have designed, tested and embodied this invention with a view to overcoming the problems of the state of the art and to producing perforated and/or punched cut snacks.

20 According to one aspect of the present invention there is provided a method for the production of perforated and/or punched cut snacks from an extruded, rolled and continuously-fed layer of dough, comprising cutting the dough by means of a plurality of hollow outlining punches arranged peripherally on a main cutter roll cooperating with opposing means so as to obtain the outer profile of the snacks, the snacks being retained momentarily within the respective hollow outlining punches,

30 discharging the snacks in a desired position from the specific hollow outlining punches, and at least frying the snacks,

wherein the snacks are retained by means of a stationary aspiration sector included within the main cutter roll and acting on the inner end of the hollow

outlining punches, the aspiration sector not affecting the zone of discharge of the snacks.

According to a second aspect of the present invention, there is provided apparatus for the
5 production of perforated and/or punched cut snacks from a layer of rolled dough, comprising at least one main cutter roll having on its periphery a plurality of hollow outlining punches and cooperating with opposing means, the main cutter roll including a stationary
10 aspiration sector connected momentarily and cyclically with the inside of the hollow outlining punches.

In a preferred embodiment of the present invention, it is possible to separate the perforated and/or punched cut snacks from the offcuts and scraps
15 of layers of dough, the offcuts and scraps being recycled to form the next sheet of dough.

According to certain embodiments of the invention a layer of dough of cereals or other flour substances,
20 whether pre-cooked or not, is prepared by extrusion and successive rolling and is caused to cooperate with at least one cutter roll, on which are arranged hollow outlining punches of a desired shape and design. The cut snacks thus produced can be retained on the cutter
25 roller or within the respective hollow outlining punches. The snacks cut by these punches are kept on the cutter roll within the punches through a certain angle of rotation of the cutter roller owing to negative pressure acting within the perimeter of the
30 hollow outlining punches.

The snacks cut by these punches may be drawn towards the inner end of the punches by negative pressure acting within the perimeter of the hollow outlining punches. This inner end may include a
35 suitable concave portion which is imprinted on the
snacks through a permanent deformation, thus producing

a three-dimensional product.

The removal of each cut snack from its relative hollow outlining punch preferably takes place by making the cutter roll cooperate with extractor means, the surface of which is subject to an intense action of negative pressure. These extractor means may comprise an extractor roll or an extractor conveyor belt.

However, the extractor means may not be needed if a suitable relative speed is maintained between the peripheral speed of the cutter roll bearing the punches and the speed of the smooth contra-rotating roll or opposing conveyor belt.

According to one embodiment of the invention, the cutter roll in the zone of cooperation with the extractor means may not undergo its own action of aspiration within the hollow outlining punches.

The extractor means may include, downstream of the engagement zone of the cutter roll, a discharge zone in which their surface is not subject to a negative pressure, the purpose of this being to be able to discharge the snacks on a suitable zone. This makes it possible to cancel the force or attraction of the snacks on the outer surface of the extractor means, thus enabling the cut snacks to be detached.

The discharge zone of the extractor means may be kept under pressure, thus exerting an outward thrust on the cut snacks located on its outer surface and facilitating the removal of the snacks; this zone cooperates with the possible extractor means.

The extractor means during their rotation take with them the cut snacks and leave them in a required position on conveyor means, which convey the snacks to the successive drying of frying step.

According to a first embodiment, the pressure of the layer of dough against the hollow outlining punches is produced by pressing the cutter roll against a

smooth contra-rotating roll. In this case, the lay-out is preferred which uses rollers positioned side by side with their axes of rotation lying on one horizontal plane and with the layer of dough moving vertically.

5 Alternatively, the pressing of the layer of dough against the hollow outlining punches may take place by thrusting the cutter roll against an opposing conveyor belt. The cutting pressure may be adjusted so as to produce snacks having an exact outer cut profile
10 irrespective of the type of dough.

So as to make holes of any shape within the outer profile of the snacks, the invention may include, upstream of the main roll cutting the outer profile, a first cutter roll bearing perforating punches which
15 produce the inner holes. These perforating punches are arranged on the first cutter roll in coordination with the hollow outlining punches arranged on the cutter roll.

The first cutter roll bearing the perforated
20 punches and the main cutter roll bearing the hollow outlining punches work in synchronization, and are preferably mechanically interconnected by a mechanism which enables the synchronisation itself to be adjusted.

25 So as to be able to eliminate the scraps produced by the perforating punches making the internal holes, the first cutter roll is preferably hollow inside and contains in its surface through holes coinciding with the respective perforating punches. The scraps coming
30 from the cutting of the internal holes made by the perforating punches are collected within the first cutter roll through these through holes by successive compression and can be recycled into the extruder. Alternatively, the scraps coming from the internal
35 holes and collected within the first cutter roll may be employed to make as many snacks of small sizes.

Advantageously, the inner cavity of the first cutter roll is kept under a negative pressure, for instance by means of an appropriate aspiration means, so as to assist the removal of the scraps coming from the internal holes.

Alternatively, a system to expel the scraps coming from the internal holes by means of compressed air may be included, this compressed air coming into action along a predetermined circular sector of the first cutter roll, this sector being located so as to expel the internal scraps onto a removal conveyor system.

The detaching of the snacks from the cutter roll can be carried out advantageously by means of compressed air, which comes into action over a pre-set circular sector of the cutter roll.

According to one embodiment of the present invention, the external and internal cutting of the perforated snacks is carried out in one single step; by means of the main cutter roll bearing the relative perforating punches within the hollow outlining punches.

In this embodiment, the perforating punches are preferably connected to the inside of the cutter roll so as to remove the internal scraps.

The scraps of dough resulting from the cutting carried out by the hollow outlining punches are preferably crumbled and sent to the extruder for recycling.

For the production of cut snacks having at least one face including recesses and/or protrusions, such as a grill for instance, the invention may include a punching roll which cooperates either with a smooth opposing roll or with an opposing conveyor belt. This punching roll obtains a grill formation by deformation on the layer of dough, that is to say, without removing material from the layer of dough.

Alternatively, the layer of dough may cooperate with two contra-rotating punching rolls so as to obtain this effect.

After the punching step, the layer of dough is
5 then caused to cooperate with the main cutter roll bearing the hollow outlining punches for the cutting of the outer profile of the snacks.

These snacks having at least one punched face can include holes within their outer profile.

10 According to a further variant, two layers of dough, whether punched or not, are superimposed parallel on one another and cooperate with a cutter roll to produce two-layer snacks which are joined together along their outer perimeter. These two-layer
15 snacks may contain internal holes and/or be punched on at least one of their faces.

According to yet a further variant, the two-layer snacks may be formed by coupling together two snacks having different outer profiles. In this case the two-
20 layer snacks may be produced by superimposing on each other single snacks positioned on two contra-rotating cutter rolls; these single snacks being joined together along any of their perimeters.

For a better understanding of the invention and to
25 show how the same may be carried into effect, reference will now be made, by way of example only, to the accompanying drawings, wherein:

Fig.1 is a block diagram of a possible method to produce cut snacks including internal holes according to
30 the invention;

Fig.2 is a block diagram of a method to produce cut punched snacks according to the invention;

Fig.3 is a diagram of a possible device which performs the method of Fig.1 and employs a first cutter roll to cut the internal holes and a cutter roll to cut the outer profile of the snacks;

Figs.4 are diagrams of four possible devices to perform the method of Fig.2;

Figs.5 are diagrams of two possible devices to make two-layer cut snacks;

5 Fig.6 is a diagram of a device which performs the method of Fig.1 and employs one single cutter roll to cut the outline of the snacks and to cut the internal holes in the snacks according to the invention;

Fig.7 shows a perforated cut snack including internal
10 holes and made with the method according to the

invention;

Fig.8 shows a partly cutaway lengthwise view of the first cutter roll of the device of Fig.3;

Fig.9 shows a two-layer snack produced with the device of Fig.5a without the formation of scraps;

Figs.10 show respectively a plan view and a section of a two-layer snack produced with the device of Fig.5a but with the formation of scraps;

Figs.11 show respectively a plan view and a section of a two-layer snack produced with the device of Fig.5b;

Fig.12 shows the scrap resulting from the cutting of cut snacks produced with the method according to the invention.

The reference number 10 in the attached figures indicates generally a method to produce perforated cut snacks according to the invention.

In the method 10 according to the invention (see Fig.1) a layer 11 of dough of cereals or other flour substances, whether pre-cooked or not, is produced with a step of extrusion 12 followed possibly by a rolling step 13.

In the case of snacks 15 containing internal holes 17 made of any shape within the outer profile of the snacks 15 the layer 11 of dough undergoes a step of cutting internal holes 16, whereby holes 17 of any shape or design are made within the outer profile of the snacks 15 as defined in a successive step and leave scraps of dough 117 which are removed.

These scraps 117 of dough are recycled in the extrusion step 12 or are sent to a final frying step 18 to produce snacks of small sizes which have the profile of the snacks 117.

Thereafter the layer 11 of dough with or without internal holes 17 undergoes a step of cutting 14 its outer profile,

whereby the outer profile of the snacks 15 to be produced is cut.

In the case of snacks 15 without internal holes 17 the layer of dough 11 undergoes only the step of cutting 14 its
5 outer profile.

According to yet another variant (Fig.6) the steps of cutting 16 the internal holes 16 and cutting 14 the outer profile are performed at the same time.

Next, the layer of dough 11 within which the snacks 15
10 have been cut undergoes a detaching and separating step 19, which provides offcuts 20 on the one hand and snacks 15 on the other hand.

The offcuts 20 of dough are returned to the extrusion step 12 after undergoing a crumbling step 21.

15 The snacks 15 leaving the detaching step 19 are sent to a frying step 18.

According to a variant the snacks 15 undergo a drying step 22 or yet another treatment step before the frying step 18.

Fig.2 shows a method 110 according to the invention which
20 is employed to produce snacks 215 punched on their surface.

In this case the layer of dough 11, before the step of cutting 14 the outer profile of the snacks 15, undergoes a step of being punched 23 on at least one of its two surfaces.

25 According to a variant the layer of dough 11 undergoes a step of cutting internal holes 16 after the punching step 23.

According to a further variant, in the method 10 to
produce cut perforated snacks and in the method 110 to
30 produce cut punched snacks 215, two layers of dough 11 are
superimposed on each other before undergoing the step of
cutting 14 the outer profile, thus making two-layer snacks
115 joined together along their outer perimeter (Fig.5a).

Fig.9 shows a two-layer snack 115 made with the device of Fig.5a without the formation of offcuts 20; in this case the layer of dough 11 has the same width as the snack 115, so that the cutting does not affect the sides, which in this way remain unconnected.

Fig.10 shows a two-layer snack 115 which is made with the device of Fig.5a and entails the formation of offcuts 20; the resulting offcuts 20 are shown in Fig.12.

Fig.3 shows a first form of effecting the method 10 to produce perforated snacks 15 according to the invention.

In this example the layer of dough 11 cooperates with a first cutter roll 24, which bears on its outer surface perforating punches 25 having the shape of the holes 17 which have to be made within the outer perimeter of the perforated snacks 15, this perimeter being defined in the next step.

The layer of dough 11 is pressed against the perforating punches 25 by a smooth contra-rotating opposing roll 27 which cooperates with the first cutter roll 24.

The layer of dough 11 is then passed along an opposing conveyor belt 28, which cooperates with a cutter roll 29 that comprises on its outer surface hollow outlining punches 125 in positions coordinated with the perforating punches 25 included on the first cutter roll 24; these hollow outlining punches 125 produce the outer profile of the snacks 15.

In the device according to the invention the first cutter roll 24 and the cutter roll 29 are in phase with each other; the synchronization of these two cutter rolls 24 and 29 is obtained, mechanically for instance, by an interconnecting mechanism, which also enables any phase difference existing between the two cutter rolls 24-29 to be adjusted and/or eliminated.

The first cutter roll 24 is advantageously hollow and

*perforating
punches
then
coordinated
with
cutter
roll.*

contains through holes 30 coinciding with the perforating punches 25 so as to enable the scraps 117 of dough to be removed.

5 According to a variant an aspiration means 31 connected to the inside of the first cutter roll 24 keeps that first cutter roll 24 under negative pressure (Fig.8).

10 According to another variant (Fig.5b) both with the method 10 and the method 110 the cutter rolls 29 include a retaining sector 29a kept under negative pressure by appropriate aspiration means, which are not shown here, and a discharge sector 29b, which is not subjected to negative pressure and is placed downstream of the retaining sector 29a.

15 This discharge sector 29b can be kept advantageously under slight pressure internally so as to assist the step of detaching the snacks 15 present on its surface.

The cutter rolls 29 can be employed to cut snacks 15 with or without inner holes 17 and to produce two-layer snacks 115.

20 Fig.5 shows a preferred form of embodiment of a device to produce two-layer snacks 115 by employing cutter rolls 29 of the above type; the two-layer snacks 115 are produced by superimposing on each other two single snacks 15 having different outer profiles (Fig.11).

25 In this example two cutter rolls 29 of the above type face each other, with the discharge sector 29b of the lower cutter roll 29 facing towards the retaining sector 29a of the upper cutter roll 29, while the discharge sector 29b of the upper cutter roll 29 cooperates with a conveyor belt 28
30 in the removal of the two-layer snacks 115.

In the zone of cooperation between the two cutter rolls 29 the snacks 15 detached from the surface of the lower cutter roll 29 at the discharge sector 29b are superimposed on the

snacks 15 retained on the surface of the upper cutter roll 29 so as to form two-layer snacks 115.

The combining of the snack 15 on the upper cutter roll 29 with the snack 15 on the lower cutter roll 29 takes place by
5 compressing the single snacks against each other along any desired perimeter.

These two-layer snacks 115 are then discharged at the discharge sector 29b of the upper cutter roll 29 onto the conveyor belt 28.

10 Fig.5a shows a second form of embodiment of a device to produce two-layer snacks 115, whereby two layers of dough 11 running along parallel vertical planes are brought alongside each other to make them pass between a cutter roll 29 and a smooth opposing roll 27 having their axes of
15 rotation lying on one substantially horizontal plane.

According to a variant (Fig.6) the layer of dough 11 passing along the conveyor belt 28 cooperates with a hollow cutter roll 29 which bears on its outer surface a plurality of hollow outlining punches 125 and perforating punches 25
20 in coordinated positions; the surface of the hollow cutter roll 29 is fully perforated for the passage of the scraps 117.

In this case the inside of the hollow cutter roll 29 is kept under negative pressure by appropriate aspirator means
25 31.

The snacks 15 stay attached to the outer surface of the cutter roll 29 owing to the tackiness of the layer of dough 11.

In this case the step 19 of detaching the snacks 15 is
30 performed by making the cutter roll 29 cooperate with a hollow contra-rotating extractor roll 33 thickly perforated with small holes 132 over its whole surface.

This hollow contra-rotating extractor roll 33 includes an

engagement sector 33a kept under negative pressure by appropriate aspiration means, which are not shown here, and also a discharge sector 33b, which is positioned downstream of the engagement sector 33a and is not subjected to
5 negative pressure.

The engagement sector 33a faces the cutter roll 29, whereas the discharge sector 33b is kept at atmospheric pressure or advantageously at a pressure slightly higher than atmospheric pressure by appropriate fan means, which
10 are not shown here.

In this way the snacks 15 are detached from the hollow outlining punches 125 on the cutter roll 29 and stay attached to the outer surface of the engagement sector 33a of the extractor roll 33 before being detached at the
15 discharge sector 33b of the extractor roll 33 and falling onto the conveyor belt 28.

Substantially at the line of separation between the engagement sector 33a and the discharge sector 33b the outer surface of the extractor roll 33 cooperates with a scraper
20 blade 34, which engages the offcuts 20, which are removed on a conveyor belt 128.

Fig.6 shows also an alternative to the extractor roll 33, whereby the opposing conveyor belt 28 is thickly perforated with small holes 32 and has its outer surface kept under a
25 slight negative pressure by a second aspirator means 131; in this case the snacks 15 stay attached to the opposing conveyor belt 28, which conveys the snacks 15 to the successive drying 22 and/or frying 18 steps.

Fig.4a, shows a possible apparatus to produce snacks 215
30 having at least one surface with a shaped profile according to the method of Fig.2.

Upstream of the cutter roll 29 the layer of dough 11 cooperates with a punching roll 26 cooperating with a smooth

opposing roll 27.

According to a variant (Fig.4b) the punching roll 26 cooperates with an opposing conveyor belt 28.

According to another variant (Fig.4c) the punching roll 26
5 cooperates with a second contra-rotating punching roll 126 positioned on the opposite surface of the sliding layer of dough 11 so as to produce snacks 215 with both their faces punched.

Thence the layer of dough 11 thus punched is sent, if so
10 required, to the step of cutting 16 (not shown here) internal holes and to the step of cutting 14 the outer profile of the snacks with one or another of the systems described above, the system being carried out in this case by a cutter roll 29 cooperating with an opposing conveyor
15 belt 28.

According to still another variant (Fig.4d) the punching roll 26 and the cutter roll 29 are caused to cooperate with respective smooth opposing rolls 27, these pairs of rolls being positioned advantageously vertically in succession,
20 with the layer of dough 11 sliding vertically downwards from above.

CLAIMS:

1. A method for the production of perforated and/or punched cut snacks from an extruded, rolled and continuously-fed layer of dough, comprising

5 cutting the dough by means of a plurality of hollow outlining punches arranged peripherally on a main cutter roll cooperating with opposing means so as to obtain the outer profile of the snacks, the snacks being retained momentarily within the respective hollow
10 outlining punches,

discharging the snacks in a desired position from the specific hollow outlining punches, and
at least frying the snacks,

wherein the snacks are retained by means of a
15 stationary aspiration sector included within the main cutter roll and acting on the inner end of the hollow outlining punches, the aspiration sector not affecting the zone of discharge of the snacks.

20 2. A method as claimed in claim 1, wherein, before the step of cutting the outer profile, there is included a step of cutting internal holes by means of a plurality of perforating punches arranged peripherally on a first cutter roll, the perforating punches of the
25 first cutter roll being synchronised with the respective hollow outlining punches on the main cutter roll, the scrap generated within the perforating punches being aspirated within the first cutter roll by action of negative pressure.

30

3. A method as claimed in claim 1, wherein, at the same time as the step of cutting the outer profile, there is included a step of cutting internal holes by means of one or more perforating punches arranged
35 within the respective hollow outlining punches and on the main cutter roll.

4. A method as claimed in any preceding claim, wherein the snacks within the hollow outlining punches are deposited on opposing means cooperating with aspiration means to remove the cut snacks.

5

5. A method as claimed in any preceding claim, wherein the snacks within the hollow outlining punches are expelled from the hollow outlining punches by overpressure means working at the discharge sector of
10 the hollow outlining punches.

6. A method as claimed in any preceding claim, wherein, before the step of cutting the outer profile, the layer of dough undergoes a punching step with a
15 punching roll.

7. A method as claimed in any preceding claim, wherein two layers of dough are coupled together and then undergo the cutting of at least part of their
20 outer profile to produce two-layer snacks connected together along at least part of their periphery.

8. A method as claimed in any preceding claim, wherein scraps aspirated through the respective
25 perforating punches within the respective cutter rolls are sent for extrusion.

9. A method as claimed in any one of claims 1 to 7, wherein scraps aspirated through the respective
30 perforating punches within the respective cutter rolls are sent for frying.

10. A method as claimed in any preceding claim, wherein before the step of frying, the snacks and/or
35 the scraps undergo a drying step.

11. Apparatus for the production of perforated and/or punched cut snacks from a layer of rolled dough, comprising at least one main cutter roll having on its periphery a plurality of hollow outlining punches and
5 cooperating with opposing means, the main cutter roll including a stationary aspiration sector connected momentarily and cyclically with the inside of the hollow outlining punches.

10 12. Apparatus as claimed in claim 11, wherein the opposing means include aspiration holes associated with means that form a negative pressure.

13. Apparatus as claimed in claim 11 or 12,
15 wherein the discharge sector of the hollow outlining punches is associated with means producing an overpressure to expel snacks.

14. Apparatus as claimed in claim 11, 12 or 13,
20 wherein the internal end of the hollow outlining punches is conformed as a shaped casing.

15. Apparatus as claimed in any one of claims 11 to 14, wherein the hollow outlining punches contain at
25 least one perforating punch which is in communication with the inside of the main cutter roll through a communicating passage, that inside being associated with aspirator means.

30 16. Apparatus claimed in any one of claims 11 to 14, wherein upstream of the main cutter roll is a first cutter roll bearing a plurality of perforated punches, the internal end of each perforating punch being void and communicating with the inside of the first cutter
35 roll, that inside being associated with aspirator means.

17. A method for the production of perforated and/or punched out snacks substantially as hereinbefore described with reference to Figure 1 or 2 of the accompanying drawings.

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18. An apparatus for the production of perforated and/or punched out snacks substantially as hereinbefore described with reference to, and as shown in, any one of Figures 3, 4a to 4d, 6 and 8 of the accompanying
10 drawings, optionally modified as hereinbefore described with reference to, and as shown in, any one of Figures 5a, 5b and 7 of the accompanying drawings.